2001 NPDES Progress Report

Cedar-Green, Island-Snohomish, and South Puget Sound Water Quality Management Areas

National Pollutant Discharge Elimination System MS4 Permits WASM10001, WASM20001, and WASM30001

Submitted to:

Washington State Department of Ecology
Water Quality Program
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SECTION 1.0
OVERVIEW

Pursuant to the National Pollutant Discharge Elimination System (NPDES) requirements for Multiple Separate Storm Sewer Systems (MS4), the Washington State Department of Transportation (WSDOT) prepared a Stormwater Management Plan (SWMP) which was approved by the Washington State Department of Ecology (Ecology) on 3 July 1997 (WSDOT 1997). The plan was prepared in response to the issuance of NPDES and State Waste Discharge General Permits issued on 5 July 1995 and effective on 4 August 1995 which designated WSDOT as a co-permitee for discharges from municipal separate storm sewers within the following:

- The Cedar-Green Water Quality Management Area (and the portion of the Kitsap Water Quality Management Area located in King County),
- The Island Snohomish Water Quality Management Area (and the portion of the Skagit-Stillaguamish Water Quality Area located in Snohomish County), and
- The South Puget Sound Water Quality Management Area (and the portion of the Kitsap Water Quality Management Area located in Pierce County).

The WSDOT SWMP was prepared to address the requirements specified under Section 122.26 of Title 40 of the Code of Federal Regulations (40 CFR 122.26), the Water Pollution Control requirements stipulated in Chapter 90.48 of the Revised Code of Washington (RCW 90.48), and the regulatory requirements for the NPDES permit program in Washington State as delineated in Chapter 173-220 of the Washington Administrative Code (WAC 173-220). The SWMP outlines WSDOT's plan to comply with federal and state standards for non-point source wastewater discharges; including compliance with the state and federal NPDES programs. The SWMP and permit cover large and medium MS4 discharges for the Cedar-Green, Island-Snohomish, and South Puget Sound management areas. As initially drafted, the three referenced NPDES MS4 permits were to expire on 5 July 2000. At this time new permit conditions are still being drafted by Ecology. These permits were administratively extended by Ecology to continue current permit requirements until the next permit(s) is (are) issued. Therefore, the 1995 permit requirements and associated 1997 SWMP remain in effect.

One of the conditions of WSDOT's NPDES permit is that an annual report be prepared summarizing WSDOT's efforts to comply with the permits and SWMP, and evaluating the effectiveness of the stormwater program. The purpose of this 2001 Annual Report is to document stormwater related activities for the period from 5 July 2000 through 4 July 2001, within the three NPDES MS4 permit areas. This report has been developed to reflect WSDOT activities based on the suite of commitments established in the SWMP. The references cited throughout this report are available through WSDOT's Environmental Affairs Office Water Quality Program, and can be obtained upon request.

In addition to the requirements placed on WSDOT by the NPDES program, the agency is also striving to meet stormwater management needs associated with the Endangered Species Act (ESA). ESA-driven upgrades to the stormwater program include: (1) stormwater mitigation measures for flow and quantity control for all projects that increase impervious surface; (2) implementation of an increase in the safety factor used to size wet detention ponds, vaults, and tanks when the Santa Barbara Urban Hydrograph is used as the design method; (3) elimination of some rivers from the exempted river list if they are identified as having endangered salmonids or as being low-flow impaired; and (4) the institution of a stream channel analysis to estimate the downstream effects of transportation projects. To a large extent, implementation of stormwater management practices relating to ESA considerations are defined in WSDOT Instructional Letter (IL) 4020.01 which was effective on 15 July 1999, as amended on 1 June 2001, and which expires on 15 July 2002.

SECTION 2.0
STATUS OF STORMWATER PROGRAM PRIORITIES

There were six elements identified in the 1997 Stormwater Management Plan as having the highest priority. These included: (1) construction of structural stormwater best management practice (BMP) facilities, (2) monitoring and research related to stormwater BMPs, (3) erosion and sediment control programs, (4) attaining full funding for operations and maintenance programs, (5) watershed-based mitigation strategies, and (6) water quality-related training. These continue to be high priorities for WSDOT. Construction of structural controls at new outfall sites has in fact gained increased emphasis due to the federal listings associated with salmon and other salmonids under the ESA.

As detailed in Section 3.0, during the 2000/2001 permit period WSDOT spent an estimated $15.3-million dollars on construction of structural stormwater controls at new outfalls and an additional $1.1-million on retrofits of existing stormwater outfalls. As important, a revised stormwater facility inventory database has been created and a plan for reprioritizing candidate retrofit locations has been developed. These resources will help to focus and track future construction of structural BMPs.

Substantial progress has also been made regarding stormwater-related monitoring and research. Section 7 of this report describes 13 projects that are related to stormwater characterization and/or BMP performance-related monitoring and research. These projects have either recently been completed or are in progress. They include a wide range of previously identified research needs; from characterizing stormwater runoff through evaluating the effectiveness of BMPs constructed using existing technology, evaluating innovative technologies, and evaluating appropriate and effective maintenance practices. During the current permit reporting period, approximately $449,000 was spent on these activities (refer to Table 3-1).

The Erosion and Sediment Control Program has been particularly successful, both in terms of providing improved training opportunities and in effectively controlling construction site impacts. The Erosion Control Coordinator's office performed a state-wide risk assessment of construction sites in the fall of 2000 and identified high risk sites for priority monitoring throughout the winter. Approximately 300 WSDOT employees and 1,133 non-WSDOT personnel attended Temporary Erosion and Sediment

Control classes during the current reporting period. The expenditures for this program have increased to $194,000 (refer to Table 3-1).

Full funding of the Operations and Maintenance Program has not yet been achieved. The 1997 SWMP identified that nine of 11 maintenance categories were previously under-funded by amounts ranging from 22 to 68 percent as compared to full funding levels. The funding increase approved in the 1997 budget was set to maintain the then current level of service. The 1999/2000 budget decreased (refer to Table 3-1) from the 1998/1999 level, likely a reflection of Initiative 695 revenue losses. During the current reporting period, some recovery of Operations and Maintenance Program funding was realized, although not to the full funding levels originally anticipated for implementation of this area of stormwater management.

WSDOT has also continued to participate in watershed-based planning programs. Although watershed management activities in the Snohomish Basin (a specific program element identified in the SWMP) were not a focus this past year, WSDOT has provided active representation on Watershed Planning and Salmon Recovery Act-related committees throughout the permit area. In addition, WSDOT participates in the Fish Habitat and Mitigation Strategy meetings for the Cedar and Green River portions of the permit area. WSDOT is also active in wetland mitigation planning, and has developed and organized a number of workshops related to this topic.

WSDOT has continued to sponsor conferences and workshops related to water quality topics and provides specific training to employees and training opportunities to outside personnel. Some specific examples include the Temporary Erosion and Sediment Control program, Adopt-A-Highway Program, Trip Reduction Program, and wetland mitigation workshops. In addition, WSDOT continues to offer opportunities to the public to be involved in transportation planning activities.

Medium and low priority activities that were identified in the SWMP included; supporting public education programs, determining maintenance requirements for BMPs, developing a tracking system for structural BMPs, identifying illicit discharges, developing a tracking system for O&M activities, monitoring O&M practices relative to water quality impacts, and developing budgetary mechanisms to fund maintenance activities associated with water quality improvements. Although some efforts have been made in most of the above categories, these are largely activities that have not been funded or prioritized for funding. The one important exception is the development of a new system for tracking stormwater facilities and prioritizing existing facilities for retrofits as described in Section 4.2.3.

In summary, WSDOT has continued to focus on those needs that are the highest priority and is striving to meet the suite of commitments identified in the SWMP. Substantial progress has been made during the current reporting period in defining the key stormwater program management elements that require enhancement to support future funding, prioritization, and program implementation. Additional efforts have been made to ensure that WSDOT's efforts are well coordinated amongst the individual programs that participate in the various aspects of the NPDES compliance and implementation program.

SECTION 3.0
FINANCIAL AND RESOURCE ASSESSMENT

Initiative 695, which was passed by voters in November 1999, reduced vehicle license fees and effectively reduced a significant portion of WSDOT's operating funds. In the past fiscal year, this has resulted in a decrease in funding and revenue shortfalls for water quality programs related to WSDOT's Stormwater Management Plan commitments.

Table 3-1 depicts stormwater related expenditures for the 6-year period in which the current NPDES MS4 permits have been in place. These numbers were generated to reflect expenditures within the general NPDES Phase I permit area. This table is provided for comparison with Table 25 in the Stormwater Management Plan (WSDOT 1997) which projected budget estimates for the listed budgetary and activity areas through the 1999/2000 permit period. The most notable change in this reporting period is the large increase in spending on retrofit projects. This activity has been an important focus over the past year (refer to Section 4.2.3). Other differences in expenditures over the past two years are probably as much a function of budget uncertainties, than changing priorities. The passage of Referendum 49 (an increase in transportation spending), followed by passage of Initiative 695 (a decrease in transportation revenues) made it difficult to effectively manage agency budgets.

TABLE 3-1. WSDOT STORMWATER MANAGEMENT PLAN BUDGET ELEMENTS AND STORMWATER EXPENDITURES OCCURRING WITHIN THE NPDES PHASE I PERMIT AREA (IN THOUSANDS OF DOLLARS)

Program Element	1995/1996	1996/1997	1997/1998	1998/1999	1999/2000	2000/2001
Stormwater BMP Construction in Highway Improvement Projects	$20,000(1)	$20,000(1)	$20,000(1)	$20,000(1)	$15,220(2)	$15,333
Stormwater Management Study to Determine Regulatory Redundancy and Evaluate Streamlining Opportunities for Stormwater Resource Management (Chandler/Fisher study)	$0	$0	$0	$0	$138	$0
Snohomish Basin/Watershed Management Projects	$0	$0	$100	$100	$40	$0
2SHB 2031 Program Administration	$0	$0	$100	$10	$10	$0
2SHB 2031 Grants	$700	$0	$0	$0	$0	$0
Stormwater Characterization and BMP Monitoring	$94	$94	$100	$100	$25	$79
NPDES Permit Fees	$46	$46	$48	$50	$52	$52
NPDES/ESA Erosion Control and Spill Prevention Training	$0	$0	$0	$0	$148	$194
Highway Runoff Manual and Eastern Washington Stormwater Design Manual Development	$0	$0	$0	$0	$138	$0
Stormwater and BMP Research Programs	$143	$143	$83	$83	$262	$370
I-4 Stormwater BMP Retrofit Projects	$0	$0	$0	$0	$65	$1,141
Stormwater Research Implementation	$0	$0	$98	$138	$140	$125
Stormwater Utility Fees	$886	$886	$886	$886	$886	$886
Stormwater Systems Operations and Maintenance	$2,587	$2,587	$2,815	$2,815	$1,598	$2,289

(1) Estimated at 5 percent of total project costs.
(2) Reflects decreases for State Highway Improvement (Category I) projects resulting from decreases in revenue caused by voters Initiative 695.

SECTION 4.0
OPERATIONS AND MAINTENANCE

This section includes an overview of maintenance practices for operating highways and information on the annual maintenance of structural controls and BMPs, research developments in ice and snow control, the use of pesticides and fertilizers, roadway sweeping, and the process of tracking hazardous material incidents. This section also includes a general discussion regarding stormwater facility management which describes newly constructed facilities, illicit discharge points, the revised outfall inventory, and the progress of the stormwater outfall retrofit program.

4.1 MAINTENANCE PRACTICES FOR OPERATING HIGHWAYS

As described in the SWMP, the commitments to maintenance practices for operating highways, include; tracking maintenance and repairs to structural controls and BMPs, reporting volumes of ice and snow control material applied to roads and research activities associated with those materials, developing an Integrated Vegetation Management Plan and tracking the amount of pesticides and fertilizers applied, reporting highway sweeping activities, and tracking hazardous material spills.

4.1.1 Maintenance of Structural Controls and BMPs

There is no system specifically designed to track maintenance activities of individual structural controls and BMPs. However, this can be evaluated indirectly through analysis of Transportation Allocation Information System (TRAINS) data. TRAINS is a labor accounting system that monitors activities based on highway segment, specific activity, labor, and equipment costs incurred.

To estimate the level of effort WSDOT spent maintaining structural controls and BMPs, TRAINS was queried to determine expenditures and personnel hours spent on specific activities. Because the TRAINS system tracks activities for the entire state, some manipulation of the data was necessary to correlate the numbers to the general area represented by the NPDES permit. Detailed surveys of the number of stormwater systems (i.e., catch basins, separators, drainage facilities, or channel conveyance systems) controlled by WSDOT over small areas were first extrapolated to a region-wide estimate of the total

number of facilities. This information was further extrapolated for each permit area based on the size of the permit area. This estimating methodology served as the basis for the development of Table 4-1.

TABLE 4-1. BUDGET AND PERSONNEL HOURS ALLOCATED TO STORMWATER FACILITY O&M ACTIVITIES IN THE NPDES PERMIT AREA, AS TRACKED THROUGH THE TRANSPORTATION ALLOCATION INFORMATION SYSTEM

O&M Activity Type	Dollars Spent in 1999/2000	Dollars Spent in 2000/2001	Personnel Hours 1999/2000	Personnel Hours 2000/2001
Grade/Reshape Shoulder	$47,000	$190,000	2,940	5,637
Sweeping and Cleaning Pavement	$386,000	$599,000	9,396	10,385
Ditching and Channel Maintenance	$100,000	$125,000	2,585	2,642
Culvert Maintenance	$158,000	$175,000	2,054	1,958
Manhole, Catch Basin and Grate Maintenance	$164,000	$199,000	5,046	4,705
Detention/Retention Maint	$37,000	$26,000	544	339
Miscellaneous Drainage Maintenance	$197,000	$203,000	868	832
Weed Control Fertilizing and Liming	--	$1,000	0	13
Residual Herbicide Application	$65,000	$86,000	1,234	1,448
Landscape Fertilizer and Liming	$1,000	$1,000	30	31
Litter/Litter Bag Clean-up	$113,000	$209,000	3,145	4,728
Winter Sand Clean-up	$28,000	$58,000	698	1,270
Sanding	$129,000	$205,000	1,062	1,732
Anti-icing & De-icing Chemical Application	$133,000	$172,000	941	1,215
Winter Drainage Maintenance	$2,000	$3,000	68	77
Hazardous Waste/Spill/Debris Clean-up	$38,000	$37,000	963	758
Total	$1,598,000	$2,289,000	31,573	37,772

In general, both expenditures and time commitments for stormwater-related activities O&M activities increased in the 2000/2001 reporting period relative to the 1999/2000 reporting period. In the future, it is WSDOT's objective to identify how O&M practices, or changes in practices, affect water quality and prioritize activities accordingly.

4.1.2 Ice and Snow Control

WSDOT is an active participant in an organization of winter maintenance professionals from British Columbia, Idaho, Montana, Oregon, and Washington, identified as the Pacific Northwest Snowfighters (PNS). WSDOT was integral in establishing the group in 1995, and continues to participate as a member of the consensus-based group. This organization's purpose is to provide specifications for the highest quality products that balance the quality of the environment with transportation considerations. PNS also conducts testing of new anti-icer/de-icer products which must meet rigid criteria for heavy metals. A document entitled *Snow and Ice Control Chemical Products Specifications and Test Protocols* was completed for PNS in August 2001. This document establishes standardized procedures for research and monitoring activities related to anti-icer/de-icer products and application protocols.

During the reporting period, research was conducted to evaluate chemical, physical, and biological changes to Peshastin Creek from the application of IceBAN and traction sand to State Route (SR) 97. Samples were collected weekly during the winter and spring of 2000 for a variety of constituents [chloride, heavy metals (total and soluble), turbidity, and total dissolved solids]. A comparison analysis was done on samples of streambed sediments and benthic macro-invertebrates, collected from both impacted and a non-impacted sections of Peshastin Creek. There was no observed degradation to water quality, streambed sediment quality, or macro-invertebrate numbers in the impacted section of the creek. Therefore, IceBAN, which can be more accurately applied than sand mixed with sodium chloride, was deemed an effective strategy for traction control applications. Although the amount of traction sand entering Peshastin Creek was not quantified, visual observations noted the potential for a significant amount of sand to enter the stream. The lack of a measurable impact on streambed sediments or benthic macro-invertebrates was attributed to the high velocity of Peshastin Creek. However, this observation leads to a concern that application of traction sand on highways adjacent to lower velocity streams could cause streambed sedimentation problems. It was therefore recommended that traction sand application be minimized, or that a traction material with a lower specific gravity be used in sensitive areas. The final report, entitled *An Evaluation of Impacts of Highway De-icers on Peshastin Creek*, was completed in April 2001 (Yonge and Marcoe 2001).

The Maintenance Office at WSDOT has also been testing anti-icer/de-icer products [e.g., First Down, All Clear, Cal Ban 70, Freez Gard Zero magnesium chloride (MgCl), CMA, and standard sodium chloride (NaCl)] for corrosion on metals such as zinc, aluminum, mild steel, and stainless steel. Preliminary results have been obtained and the final report is expected to be completed next year. Refer to Table 4-1 for a breakdown of maintenance personnel hours and expenditures allocated to snow and ice maintenance activities including; winter sand clean-up, sanding, anti-icing and de-icing chemical applications, and winter drainage maintenance. Table 4-2 provides details on the quantities and costs of de-icer materials used in the 1997/1999 and 1999/2001 biennia.

TABLE 4-2. DE-ICER QUANTITIES AND EXPENDITURES FOR SNOW AND ICE REMOVAL IN WASHINGTON STATE				
Product	**1997/1999 Usage**	**1999/2001 Usage**	**1997/1999 Expenditures**	**1999/2001 Expenditures**
CG90, 28% Magnesium Chloride (MG)	194,711 gallons	0	$89,567	$0
CG90, 25% MG	274,785 gallons	59 gallons	$129,149	$5,691
Sodium Chloride	0	1,692 gallons	$0	$73,856
Liquid Freeze Gard IB4	9,512 tons	8,375 tons	$83,040	$6,114
CG90, solid, orig	13,309 tons	0	$2,285,156	$0
CG90, solid, orig 10% MG	1,245 tons	524 tons	$212,858	$44,357
CG90, solid, orig 22% MG	1,093 tons	629 tons	$211,769	$107,031
CMA, solid, super sack	120 bags	237 bags	$146,459	$282,030
Ice Slicer Meltdown 10	0	382 tons	$0	$68,378
Liquid Cal Ban	0	13,400 tons	$0	$1,795,600
Ice Ban, 70% calcium chloride	10,470 gallons	30,706 gallons	$80,096	$27,021
Total	**505,245**	**56,004**	**$3,238,094**	**$2,410,077**

Please note that these are state-wide values. At the time that this report was prepared it was not possible to determine de-icer quantities used by either individual WSDOT Regional operations or for the specified permit areas. In addition, the quantities of sand abrasives used for the prior two biennia were not available.

4.1.3 Integrated Vegetation Management

The WSDOT Maintenance Department is continuing to improve its vegetation management practices to minimize the use of pesticides, particularly in environmentally sensitive areas. WSDOT's objective is to identify environmentally sensitive areas, such as wetlands, water resources, and critical aquifer recharge areas for drinking water supplies, within 300 feet of any state highway. The purpose of this mapping project is to identify all sensitive area locations and provide guidance to WSDOT maintenance crews so that BMPs may be applied to eliminate or reduce impacts of maintenance activities on streams, wetlands, and water bodies. This includes training maintenance personnel to raise awareness and sensitivity for applications within the proximity of these sensitive areas throughout the state. A secondary objective is to note those areas that are particularly sensitive or insensitive in order to allow for prioritizing application of BMPs. The development of detailed procedures regarding mapping protocols, anomalous situations, the data collection database, field preparations, common mistakes, follow-up work, and desired expertise and resources was completed in July 2000, and summarized in the document entitled *Roadside Sensitive Area Mapping Project - Suggested Field Protocols and Procedures.*

The status and schedule for data collection for mapping sensitive areas is summarized as follows:

- North Central and Southwest Regions - Completed in 2000.
- South Central Region - Completed in 2001.
- Northwest and Olympic Regions - In Progress, estimated completion in winter of 2001.
- Eastern Region - Scheduled during the 2001/2003 biennium.

Herbicide use is tracked through a record of herbicide applications that includes: (1) the herbicide used (by trade name), (2) the total amount used, and (3) the number of acres treated. Table 4-3 summarizes the acres of right-of-way treated and quantities used by county. It is important to note that this acreage is an *overestimate* of the true acreage that was sprayed as it was calculated based on adding the application areas of each material. Many applications are actually made with a combination of products.

TABLE 4-3. SUMMARY OF HERBICIDE PRODUCTS USED AND THE NUMBER OF ACRES TREATED IN NPDES PERMIT COUNTIES

County	Number of Products Used	Quantity Used		Approximate Number of Acres Treated
		Pints	Pounds	
Clark	18	3,607	1,150	852
Clark/Skamania	4	130	0	26
King	33	8,447	295	1,665
Pierce	24	6,543	3,862	2,177
Pierce/Thurston	6	607	0	168
Snohomish	31	6,648	6	3,183
Thurston	25	5,280	7,948	1,076

Herbicide applications on the bare ground maintenance zone (edge of the pavement) have been consistently applied over the past five years. A significant state-wide reduction in this type of application occurred in 1995, following a value engineering study which concluded that the width of the bare ground zone should be reduced wherever possible.

Herbicide applications for noxious weed control and tree and brush control (site distance and clear zone) have improved as maintenance areas have acquired new spray trucks. The new trucks have the ability to apply herbicides with (invert) oil as a carrier and require roughly half the herbicide per acre as traditional water-based applications. Approximately 90 percent of the WSDOT fleet has been updated as of this permit reporting period. Invert applications also allow for more efficient and effective weed control by allowing applications to occur in more adverse conditions of wind and precipitation, thereby improving application timing in relation to plant growth cycles. Applications conducted in this manner also provide

the capability to "inject" various herbicides as needed during the course of operations to address specific weeds (as opposed to using a standard "tank mix"). The advantages gained through new and improved equipment are leading to better weed control overall, and should result in a reduction in the amount of herbicide use over the coming years. For example, during the current reporting period the average amount of herbicide applied per acre has been reduced, although the total number of acres treated has increased because of improved efficiency.

The Integrated Vegetation Management Program Plan, written in 1997, continues to be used by local managers to guide and train field operators in roadside maintenance.

4.1.4 Roadway Sweeping

Approximately 10,385 hours of personnel time and close to $600,000 were spent sweeping the highways within NPDES permit areas to remove large particulate matter that would have otherwise entered the stormwater systems. This represents nearly a 10 percent increase in time and a 35 percent increase in budget over the previous reporting period.

4.1.5 Hazardous Material Tracking

Hazardous material spills are currently tracked in conjunction with the Washington State Patrol and/or the local law enforcement agency responding to the site of an accident. The information is documented on an accident form, which records only whether a hazardous material was involved. It does not document the material involved, the quantity released, or the clean-up status. The WSDOT Transportation Data Office, in conjunction with the Environmental Affairs Office Environmental Information Management Program, is in the process of upgrading the Traffic Accident Data System to incorporate additional information regarding hazardous materials incidents on the state highway system. At this time, information regarding the involvement of hazardous materials in collisions is added to the notes section of the tracking system. The information is then entered into the collision records system. This system is currently backlogged, and obtaining data from this permit reporting period was not possible.

4.2 STORMWATER FACILITY MANAGEMENT

The commitments to stormwater facility management, as described in WSDOT's Stormwater Management Plan, include: (1) reporting the numbers and types of permanent stormwater control BMPs

constructed, (2) inventorying illicit discharge connections and monitoring corrective actions, (3) identifying stormwater outfalls that need retrofits, and (4) continuing to modify/upgrade the retrofit prioritization index, as needed.

4.2.1 New Facilities

The SWMP identified construction of permanent structural stormwater BMPs as its highest priority. Facilitating construction of BMPs to treat WSDOT's highway runoff, either through transportation improvement (capacity expansion) projects or by stand alone retrofits, is believed to be the most efficient way to promote compliance with state water quality standards. WSDOT Regional Offices are required to investigate the feasibility of upgrading stormwater facilities during a highway improvement project. Determining feasibility is dependent on the level of available funding and right-of-way to construct stormwater BMPs.

As specified and required under WSDOT's Highway Runoff Manual (HRM), whenever a roadway is expanded by greater than 5,000 square feet of impervious surface, WSDOT oversees the construction of permanent structural BMPs to treat runoff for both water quality and quantity. Table 4-4 provides a summary of BMPs constructed within the general permit areas between July 2000 and July 2001. A complete description of each BMP with milepost, offset direction, BMP type, and facility size is provided in Appendix A.

TABLE 4-4. STRUCTURAL STORMWATER BEST MANAGEMENT PRACTICES COMPLETED IN THE NPDES PERMIT AREAS DURING THE 2001 CONSTRUCTION SEASON

Project Designation	Number and Type of Structural BMPs Constructed			
	Open Water Detention	Detention Vault	Infiltration Pond	Linear Treatments (1)
SR 7 MP 40-42.5	4	0	2	10
SR 512 94th Ave I/C South Hill Park-and-Ride Lot	1	1	0	0
SR 507 Bald Hills Road to MP 36.5	0	0	0	2
SR 5 Ridgefield Weigh Station Stormwater System	0	0	1	1
SR 14 SE 92nd Avenue Interchange	0	0	5	5
SR 542/Sunset Vicinity to Nooksack River Bridge	0	0	2	6
SR 520 104th Avenue NE to West Lake Sammamish Parkway	1	2	0	15
SR 520 NE 40th Street Vicinity	0	1	0	6
SR 2 Sultan-Startup Road Channelization	0	0	8	9
SR 5 Stanwood/Bryant Vicinity NB Weigh Station	5	0	0	3
Totals	**11**	**4**	**18**	**57**

(1) Linear Treatments include biofiltration swales, infiltration trenches, and vegetated ditches.

There are also many vegetated conveyances, filter strips, and buffer zones that exist along many state highways that are essentially functioning as structural stormwater BMPs, but were not engineered specifically for that purpose.

4.2.2 Illicit Discharge

To more readily track observations/reports of illicit discharge points, the WSDOT Water Quality Program and Maintenance Office anticipate implementing an information tracking system to record observations of illicit discharges as a part of the revised Stormwater Facility Inventory Database (refer to Section 4.2.3, Outfall Inventory and Retrofits). The Environmental Affairs Office at WSDOT is leading the effort to revise and reformat the existing database. Locating illicit discharge points has not been identified as a high priority item, thus there is no proactive program in place at this time for identifying these points. During the initial WSDOT stormwater facility inventory within the NPDES permit areas, observations of illicit discharge connections were generally noted in field records and outfall inventory forms. However, no formal policy or procedure has been established at this time for reporting or enforcement to facilitate corrective actions pertaining to illicit discharges. Before committing to a more intensive inventory or investigative process, a response system for corrective actions should be developed.

4.2.3 Outfall Inventory and Retrofits

Identification of stormwater outfalls and retrofit needs continues to be a critical agency need. A great deal of effort and progress has been made during the current reporting period toward organizing and prioritizing outfall information. WSDOT conducted its initial inventory of stormwater facilities over the period from approximately 1993 to 1995, and at that time created a database containing inventory records for approximately 3,700 facilities. A retrofit prioritization index was also developed, and approximately the top 300 priority outfalls (based on a set of variables assessing potential water quality impacts and costs and benefits of BMP retrofits) were ranked. During the 2001 reporting period, the outfall inventory database has been updated, a database validation process has been completed, a revised prioritization index and procedure has been developed, and a procedure for scoping and developing preliminary cost estimates for retrofit projects has been defined. Each of these efforts is described in the following paragraphs. WSDOT has identified the stormwater facility inventory, programming, and retrofit implementation process as a priority over the next three biennia.

During the current reporting period, the WSDOT stormwater facility inventory database has been revised and reformatted to better serve pending programming, planning, and stormwater mitigation activities. In

the fall of 2000, WSDOT conducted a data needs analysis and developed a design specification for an improved stormwater facility inventory database. It was determined that a database system combining Microsoft Access 2000 and SQL Server would most effectively meet these requirements. In 2001, a modified version of the database was constructed which included converting the existing singe-table data structure to a set of relational data structures in a client-server environment, and development of appropriate data systems to facilitate future expansion. A revised user interface provides data navigation and querying tools, form-based access to data, and visual representation of relationships between data fields. Data from the original database has been migrated to the revised relational structure.

Also during the 2001 reporting period, an assessment was made of the quality and accuracy of the information present in the existing stormwater facility inventory database. This effort was conducted in two phases. The first phase included validation of the input data in the existing database by identifying potential transcription errors from the field inventory forms. The second phase entailed field visits to a total of 51 locations which included 36 high priority stormwater outfalls and 15 low priority outfall locations.

While the data input process was determined to have been relatively complete and accurate, there were discrepancies noted between the original field forms and the information residing in the database. For the most part, these discrepancies seemed to reflect undocumented modifications and updates of the information originally input. One of the most common findings of the field survey effort was a failure to note available features that could be utilized as stormwater outfall BMPs. Grass swales, bioswales, and filter strips were present at approximately 28 of the 51 locations examined. In addition, it was noted that the suite of potential retrofit alternatives was limited in the original field survey, and that frequently insufficient detail was provided on the field forms to effectively support subsequent BMP scoping activities and planning level cost estimating. Based on the validation assessment, 25 projects (approximately half of those reviewed) were found to lack sufficient information to support planning and programming activities. Based on these findings, WSDOT is currently developing procedures to address the identified deficiencies and will supplement existing information at those locations where the initial inventories were conducted.

WSDOT has also revised the stormwater facility retrofit prioritization index to address ESA concerns and has made other modifications and updates. In addition, the preliminary cost estimates originally prepared for implementation of retrofits at the high priority stormwater facility locations were revised. The purpose of the revisions was to take advantage of a more diverse suite of BMP alternatives, to provide

updates and verify calculations related to impervious surface area, and to incorporate current unit cost estimating information.

The revised stormwater facility prioritization index and ranking system was used to re-prioritize the top 303 outfalls included in the existing database. The documentation package to support the ranking system, entitled *I4 Stormwater Retrofit Program Task 4 – Reprioritization of Outfalls Technical Memorandum* was completed in 2001 (Tetra Tech 2001). The objectives of this work were to: (1) update information on cost as it pertains to retrofit implementation; (2) incorporate additional considerations and priorities relating to ESA concerns, traffic volume, and impervious area for BMP retrofit projects; and (3) reprioritize retrofit projects based on revised parameters and ESA considerations. A summary of the modifications made to the stormwater facility retrofit prioritization index is provided as follows:

- **Beneficial Uses of the Receiving Water Body:** Modifications to the index were made to address fisheries violations and for fisheries protection (for critical salmon streams). Revisions were also incorporated for consideration of hydraulic connection to the subject receiving water body and ESA listing status for the receiving water body.

- **Highway Contribution to Total Runoff in Watershed:** Consideration of percent highway drainage contributing to the watershed was replaced with total impervious surface area contributing to the watershed.

- **Highway Contribution to Runoff:** Updated information pertaining to average daily traffic (ADT) counts was also incorporated into the revised prioritization index and considered in the re-prioritization process.

- **Quality of Receiving Water:** Additional modifications were made to the index to give additional weighting to marine water and Class AA and B receiving waters to address ESA considerations. In addition, the database for the high priority sites was updated to reflect the most recent information available regarding impaired surface water listings.

- **BMP Capital Construction Cost:** The revised preliminary cost estimates for implementation of stormwater mitigation measures at the specified high priority locations were incorporated into the re-prioritization process.

The referenced report presents the revised rankings for 303 outfalls in the WSDOT priority outfall database, including 135 dry well sites. The report appendices include tables documenting the prioritization index data modifications and resulting impacts on scoring and priority ranking. The report also includes the following recommendations to support subsequent modifications to the prioritization process:

- All WSDOT outfalls should be geographically defined by latitude/longitude or other compatible map reference system.
- Using the methods developed for the priority outfalls, additional studies should be conducted for lower-ranked outfalls.
- Some capability for addressing species covered under pending NPDES regulations (including mammals, insects, birds, and plants) should be developed as needed.
- The WSDOT stormwater facility inventory database should be updated and checked periodically.
- Use and maintenance of the database should be coordinated with Regional Offices.
- The ESA evaluation should be updated for Distinct Recovery Units for bull trout which are being developed by the Washington State Department of Fish and Wildlife.
- The database should be updated with capital improvement-program construction information following project completion and inspection.

WSDOT has also developed a Standard Operating Procedure for scoping and estimating the costs of water quality retrofit projects for planning and programming purposes. This procedure is based on the evaluation of eight water quality retrofit projects, the development of preliminary cost estimates for approximately 200 high priority retrofit locations, and the review and editing of the retrofit prioritization process. The process is divided into four steps that include: (1) information gathering, (2) office analysis, (3) field investigation, and (4) BMP recommendations.

SECTION 5.0
CONSTRUCTION SITE CONTROLS AND TRAINING

This section of the report documents temporary erosion and sediment control (TESC) program implementation, new TESC product research, the Erosion Control Training Program, and public education efforts that have occurred in this permit reporting period.

The commitments to construction site controls and training, described in WSDOT's Stormwater Management Plan include; implementing TESC plans, BMPs, and on-site controls; evaluating BMP effectiveness; providing on-site technical assistance; participating in research to identify effective TESC methods and practices; and developing erosion control training programs.

5.1 TESC IMPLEMENTATION

WSDOT has an active, effective program for controlling construction site impacts. The State-wide Erosion Control Coordinator's office within the Environmental Affairs Office Water Quality Program, has the primary responsibility for overseeing TESC implementation. This office provides technical assistance throughout the state, usually visiting a site within 24 hours of a request for assistance. Each WSDOT Regional Environmental Office also has a designated person to provide technical support for erosion control, which was provided to all sites that had the potential for issues to develop relating to construction impacts.

In addition to requested assistance, the State-wide Erosion Control Coordinator's office performed a state-wide assessment of erosion control measures at construction sites in the fall of 2000. Within the Northwest, Olympic, and Southwest Regions there were a total of 51 site assessments completed, encompassing all but three earthwork projects within these Regions. The purpose of these assessments was to evaluate erosion control efforts on each site. Each site was evaluated and rated for overall risk, erosion control considerations, off-site impact potential, and site damage. Sites that were assessed as being high risk (a total of five, all within the Northwest Region) were closely monitored throughout the winter. The majority of the sites had a moderate risk rating, and none or low ratings for erosion, off-site impact, and site damage. A breakdown of these site assessment results is provided in Table 5-1.

TABLE 5-1. EROSION CONTROL SITE ASSESSMENT SUMMARY (2000-2001)																
		Overall Site Assessment Rating														
	Total	Risk			Erosion				Off-site Impact				Site Damage			
Region	Sites	Low	Mod	High	None	Low	Mod	High	None	Low	Mod	High	None	Low	Mod	High
Northwest	23	6	12	5	5	15	2	0	19	3	0	0	12	9	1	0
Olympic	18	6	12	0	6	9	3	0	12	5	0	0	12	5	0	0
Southwest	10	8	2	0	5	1	3	0	9	0	0	0	7	1	1	0
Total	51	20	26	5	16	25	8	0	40	8	0	0	31	15	2	0

A total of 24 sites received follow-up visits. Assessment sheets for all visits are on file in the Erosion Control Coordinator's office (a database containing this information has not yet been created and is contingent upon receipt of funding to support this effort). During the current reporting period, there were only two sites, both in the Northwest Region, with regulatory involvement, including one site which was visited by Ecology staff and another that was issued a warning by Snohomish County. However neither site was cited for violating erosion control criteria. There were also no known erosion-related notices of correction or fines levied against WSDOT in the last wet season.

5.2 EROSION CONTROL SPECIFICATIONS

During the current reporting period, the WSDOT Erosion Control Coordinator amended the Standard Specifications for erosion control on construction projects. A series of erosion control General Special Provisions (GSPs) were also created and made available for designers so that they can augment contract requirements to fit the erosion control needs of specific projects. The Spill Prevention GSP was also re-written in its entirety. The erosion control amendments were adopted on 6 August 2001 and will be included in the 2002 Edition of WSDOT Manual M 41-10 entitled *Standard Specifications for Road, Bridge, and Municipal Construction, M 41-10.*

This effort was undertaken to provide WSDOT with sufficient contractual control to enforce erosion control and spill prevention requirements on construction sites to the standards set in NPDES construction permits. Many of the amendments were made in anticipation of new BMPs allowed by Ecology's *Draft Storm Water Management Manual for Western Washington.* A summary of the new and revised specifications and general special provisions completed during the reporting period is provided as follows:

- Limiting the extent and duration of soil disturbance to meet construction permit requirements, especially in the wet season.
- Requiring erosion control training of contractor Erosion and Sediment Control (ESC) leads.
- Requiring contractors to monitor, report, and keep records of BMP effectiveness as required in construction permits.
- Providing guidelines for handling groundwater in accordance with Ecology's *Draft Storm Water Management Manual for Western Washington.*
- Requiring pond installation as a first step in grading.
- Adding new specifications for 10 Best Management Practices.
- Increasing controls on BMP maintenance.
- Revising material specifications to allow the most recent materials and designs.
- The GSPs were written to encourage the use of site-generated wood mulch, increased track-waking to prevent erosion, tight lining run-on away from construction, and application of polyacrylamide (PAM) as a soil stabilizer in accordance with Ecology's *Draft Storm Water Management Manual for Western Washington.*

5.3 NEW TESC PRODUCTS RESEARCH

A *Products and Services Catalog for Erosion and Sediment Control* developed by the Erosion Control Program was completed in March 2001. The catalog is a source of information on erosion and sediment control products for those working on construction sites and other disturbed areas in the state. The catalog can be accessed at: http://www.wsdot.wa.gov/eesc/environmental/programs/hazwqec/wqec.htm. It contains product information, service information, and company contact information for product manufacturers, product suppliers, and service providers. It also includes details on product material composition, specifications, costs, and application limitations. Over 500 products are included in the database. Products are organized into 23 types, ranging from catch basin inserts to tackifiers. Known providers of 13 services, ranging from catch basin cleaning to watering trucks, are also covered in the catalog.

5.4 EROSION CONTROL TRAINING PROGRAM

WSDOT personnel attend an 8-hour general erosion control course. The course is intended to provide all employees with a basic understanding of environmental issues and erosion control strategies. In this permit reporting period, approximately 300 WSDOT employees completed the course. Design staff attend an additional 2-hour class specifically aimed at improving the quality of erosion control plans. A 2-hour class is currently being developed for construction office staff to help with trouble-shooting in the field. The class is in the design phase and is expected to be implemented next year. Additional informal training occurs in the field on an as-needed basis throughout the state.

5.5 PUBLIC EDUCATION

A Construction Site Erosion and Sediment Control Certification Course has been developed for non-WSDOT personnel. The course is required for contractors to be eligible to work on WSDOT earthwork projects. This 16-hour course includes 2-hours of spill prevention training. The course was largely taught by a private educational organization under WSDOT oversight. Between September 2000 and June 2001, a total of 35 classes were offered throughout the state (Table 5-2). The class was attended by 1,133 contractors, consultants, and local resource agency staff.

TABLE 5-2. SUMMARY OF TESC PUBLIC EDUCATION CLASSES THROUGHOUT THE STATE BY COUNTY (2000-2001)

Location	Number of Classes	Number of Participants
King County	13	465
Kitsap County	6	192
Pierce County	3	86
Snohomish County	2	76
Thurston County	2	73
Eastern Washington	3	66
Clallam County	1	48
Skagit County	1	36
Lewis County	1	29
Whatcom County	1	25
Clark County	1	22
Grays Harbor County	1	15

SECTION 6.0
OTHER PROGRAM COMPONENTS

This section of the report contains information on other aspects of the Stormwater Management Program that have not been addressed in the Operations and Maintenance or Construction Site sections. It includes information on watershed planning efforts, inter-agency coordination efforts, and progress on cost-benefit analyses for BMPs.

6.1 PLANNING AND TMDL PARTICIPATION

WSDOT is continuing to employ a watershed approach to direct transportation mitigation dollars toward high priority watershed recovery efforts. To that end, WSDOT is working cooperatively with other state and local agencies, and planning groups. The objective of these efforts is to align required mitigation activities with local restoration goals.

WSDOT participates on various committees associated with the Salmon Recovery Act (ESHB 2496), the Watershed Management Act (ESHB 2514), and numerous other state and local agency forums related to watershed governance and planning structures. Some of the primary activities include participation with the Chehalis Basin Partnership [Water Resource Inventory Area (WRIA) 22 and WRIA 23], the Puyallup River Watershed Council (WRIA 10) and the Nisqually Watershed Council (WRIA 11). WSDOT has led the River Corridor Analysis effort to identify reach-scale restoration opportunities throughout the state. In the Yakima Basin, WSDOT has worked to make topographic data from aerial photograph analyses on the Naches River available to local planning groups. In the Snohomish/Skykomish Basin (WRIA 7) WSDOT has worked with local watershed planning groups on data acquisition and sharing. WSDOT also provides outreach to other watershed groups as requested, concerning environmental programs and WSDOT's approach to providing mitigation via a watershed-based approach.

Since 1999, WSDOT has been working with local communities and co-lead agencies on the Interstate-405 Corridor Program. The purpose of the program is to find solutions to freeway and neighborhood congestion while protecting the health of fish and fish habitat. The program approach is to hold "environmental enhancement" meetings with state and local agencies to identify fish habitat mitigation

priorities within the basin. In 2001, Fish Habitat and Mitigation Strategy Meetings occurred in WRIA 8 (Cedar/Sammish River Basin) and WRIA 9 (Duwamish/Green River Basin).

WSDOT is also supporting broad-based planning efforts by developing and hosting Partnership Workshops. In the past year, three workshops occurred in the WSDOT Eastern, Northwest, and Southwest Regions. These are a forum for exchanging information and forming partnerships between WSDOT and persons/agencies involved in environmental mitigation, restoration, and enhancement projects. Specific workshop topics include: (1) Alternative Mitigation Guidance, (2) the Advance Environmental Mitigation Revolving Account, and (3) Wetland Mitigation Banking.

6.2 O&M COSTS AND COST/BENEFIT ANALYSIS

The WSDOT Cost/Benefit Analysis Program within the Environmental Affairs Office is in the early stages of development. The first step is to define a process for carrying out the analysis of costs and benefits associated with different stormwater BMPs. The following program elements have been identified:

- Develop a set of stormwater treatment cost functions that include both construction and O&M costs for various BMPs. The life cycle concept will be applied to allow comparison of BMPs with varied life cycles.
- Develop stormwater treatment unit benefits from other BMP effectiveness studies. Benefits will be derived based on factors such as unit benefit, BMP effectiveness, water quality volume, pollution loading, and beneficial use weights.
- Conduct case studies of typical BMPs, performing standard BMP cost/benefit analysis, and incorporate the results into the Highway Runoff Manual to aid in selection of efficient BMPs.

In addition to developing these program elements, a research project to evaluate several new BMPs was funded by the American Association of State Highway and Transportation Officials (AASHTO). A cost/benefit analysis will be one component of the project.

A report regarding the implementation cost analysis of NPDES stormwater control requirements, entitled *Cost Analysis; Washington Department of Ecology Year 2001 Minimum Requirements for Stormwater Management in Western Washington,* was completed in cooperation with Ecology in August 2001 (Herrera Environmental Consultants 2001). This cost analysis provides information regarding the cost impacts of the updated Ecology stormwater manual. It is intended to be used by stormwater program

managers needing to comply with NPDES requirements throughout the state. The document will be distributed with the updated stormwater manual and will be linked on Ecology's website.

Finally, a stormwater application model is being developed to assess both costs and benefits of stormwater treatment and identify cost effective alternatives. This application was designed for use during project planning. Planners will use the model to provide more accurate budget data and improve long-range plans. Project managers will use it to rank potential environmental retrofit projects; and support programming, planning, and estimating for priority needs. Design engineers will use the model to determine the practicality of implementing specific stormwater mitigation practices. BMP effectiveness data are being compiled from various research sources, and the resolution of the model is at the watershed level. The software for the model is expected to be available in 2002. Review and documentation of the study, including benefit transfer, cost functions, benefit index, and computer application will be also be available in 2002.

SECTION 7.0
MONITORING

This section of the document includes a description and summary of findings from stormwater characterization monitoring, BMP effectiveness/performance monitoring, and research monitoring activities that have occurred within the past year. Summary information pertaining to the status of the WSDOT stormwater monitoring program is provided in tabular format in Appendix B to this report including, where applicable, cross-reference to those elements of the program that were identified in Table 21 of the WSDOT SWMP (WSDOT 1997)

7.1 STORMWATER CHARACTERIZATION

The commitments to stormwater characterization monitoring described in WSDOT's SWMP include; routine monitoring of stormwater for total and dissolved solids, metals, nitrates, phosphates, petroleum products, and polynuclear aromatic hydrocarbons (PAHs); annual priority pollutant and pesticide scans; and wet and dry season testing of toxicity using Microtox (BBT) assays.

7.1.1 General Characterization

The purpose of this portion of the monitoring program is to characterize the quality of stormwater being generated by state highways within the permit areas. Since it can be assumed that stormwater quality may differ depending upon roadway use, four categories defined by ADT have been identified; including low volume (less than 30,000 ADT), medium volume (30,000 to 100,000 ADT), high volume (100,000 to 200,000 ADT), and ultra-high volume (greater than 200,000 ADT). The following sections provide a description of each characterization site selected and the status of activities at the site.

Low Volume: This site is located on SR 8 in western Thurston County. Characterization of this site is complete and was summarized in the 4th Year NPDES Annual Report (WSDOT 1999).

Medium Volume: A site has been selected on SR 8 in rural Thurston County. This is a site of current research efforts (refer to Section 7.2.3) and initial pesticide screening (refer to Section 7.1.2) has

occurred. A general stormwater characterization monitoring plan has not yet been developed. However, it will be similar to the plan developed for the high volume site (described below) to allow comparison of the data. This monitoring effort is scheduled to begin in WSDOT's Fiscal Year 2001/2002 if staffing needs are met at that time.

High Volume: Initial efforts to monitor a high volume site focused on a location on SR 5 near Vancouver. However, this site was abandoned due to safety concerns. A new site has been selected on SR 5 in Olympia. The site was chosen because it met the ADT requirement and because the drainage is comprised almost entirely of WSDOT right-of-way. This location also provided an opportunity for WSDOT to partner with the City of Olympia during the collection and assessment of data. The stormwater treatment system was designed and constructed through a WSDOT-administered grant, but it is owned and operated by the City of Olympia. The stormwater treatment train includes a detention pond, waterfall, bioswale, and a wetland cell. The City of Olympia will monitor the treated stormwater and assess the treatment effectiveness of the facility. WSDOT will provide highway runoff characterization data (i.e., inflow monitoring).

A detailed monitoring and QA/QC plan for this site has been prepared by WSDOT's Water Quality Program [WSDOT 2001(a)]. Automatic samplers were installed in December 2000 and stormwater sampling is scheduled to resume in the 2001/2002 wet weather season. Pesticide monitoring has also occurred at this site, and details of this effort are provided below.

Ultra-High Volume: A site on SR 5 at the Ship Canal Bridge in Seattle was selected as the ultra-high volume site. Monitoring has commenced at this site and is fairly intensive. In addition to collection of routine samples that can be used for characterization, new BMPs are being evaluated, which are summarized in Section 7.2.4. Results from this testing will not be available until late in 2002. Priority pollutant screening has been done and is summarized in the Section 7.1.2.

7.1.2 Priority Pollutant/Pesticide Scans

Priority pollutant and pesticide screening was conducted by WSDOT's Water Quality Program, on sediments collected at three long-term stormwater monitoring sites. These sites include the medium, high, and ultra-high traffic volume monitoring locations; including: SR 8 in unincorporated Thurston County; SR 5 in the City of Olympia; and SR 5 at the Ship Canal Bridge in the City of Seattle, respectively.

The monitoring plan [WSDOT 2001(b)] was completed this year and the initial monitoring completed. The procedures and methods performed under this sampling plan will serve as the basis for the development and implementation of a pesticide-monitoring program at WSDOT's long-term monitoring sites.

The following is a summary of the results from this monitoring effort [WSDOT 2001(c)]. Each sample was analyzed for 13 metals, 20 chlorinated pesticides, and 12 chlorinated herbicides. Only those parameters for which the contaminant was detected have been included in the summary table below. Since Washington State has yet to develop freshwater sediment standards, results were compared to Canadian sediment standards (refer to Table 7-1).

Priority pollutant metals were detected at all three sites. These included; arsenic, cadmium, chromium, copper, lead, zinc, and mercury. At the medium volume site (SR 8), both the chromium and copper concentrations exceeded the Canadian Sediment Quality Guidelines (SQGs). At the ultra-high volume site (SR 5/Ship Canal Bridge), arsenic, cadmium, copper, lead, and zinc exceeded the SQG. No exceedances were measured at the high volume (Olympia) site.

TABLE 7-1. SUMMARY OF PRIORITY POLLUTANT METALS AND CHLORINATED PESTICIDES DETECTED IN HIGHWAY RUNOFF SEDIMENTS[1]

Parameter	SR 8/Thurston Co. (MP 15.8)	SR 5/Olympia (MP 106.5)	SR 5/Seattle - Ship Canal Bridge (MP 169)	Standard[2]
Arsenic	ND[3]	4.4	6.5	5.9
Cadmium	ND	ND	2.8	0.6
Chromium	140	28	28	37.3
Copper	170	24	76	35.7
Lead	10	7.1	38	35.0
Nickel[4]	95	32	19	--
Zinc	91	62	270	123
Mercury	0.048	ND	0.029	0.17
4,4'-DDT	ND	ND	5.1 ug/kg	1.19 ug/kg
Heptachlor epoxide	ND	ND	1.7 ug/kg	0.60 ug/kg

[1] All concentrations are in milligrams/kilogram (mg/kg) except where noted (ug/kg=micrograms/kilogram).

[2] CCME, 1999. Canadian Sediment Quality Guidelines for the Protection of Aquatic Life (Freshwater) from the Canadian Council of Ministers of the Environment, 1999, as updated 2001.

[3] ND = Not detected above the laboratory reporting limits.

[4] No Sediment Quality Guidelines available for comparison.

Chlorinated pesticides were not detected at either the medium volume (SR 8) or high volume (SR 5/Olympia) sites. However, the chlorinated pesticides DDT and heptachlor epoxide were detected at the ultra-high (SR 5/Ship Canal Bridge) site at levels that exceeded the SQGs. No chlorinated herbicides were detected in sediment collected from any of the three sites.

7.1.3 BaySaver Monitoring at State Route 101

A third part of the stormwater characterization monitoring activities is associated with the installation of a relatively new stormwater facility known as Baysavers®. These facilities are being tested for effectiveness as part of a separate monitoring element (refer to Section 7.2.4). However, it is also necessary for WSDOT to determine life cycle maintenance requirements for these facilities. WSDOT's Water Quality Program is leading this effort. A monitoring plan, completed in 2001, presents the procedures to be used during the monitoring of an experimental stormwater BMP, the Baysaver® Separation System (U.S. Patent Number 5746911), installed at five locations along SR 101 within the City of Port Angeles, in Clallam County [WSDOT 2001(d)]. Monitoring will be performed by WSDOT's Environmental Affairs Office (EAO). The goal of this effort is to characterize the life cycle maintenance requirements of the Baysaver® Separation System.

Monitoring has begun and is expected to continue through January 2003. A final report of the results will be completed at the conclusion of the monitoring effort.

7.1.4 Microtox – Toxicity Studies

A Microtox® acute toxicity study was performed to determine the acute toxicity of NaCl, $CaCl_2$, IceBAN, and CMA as part of the project conducted on Highway De-icers on Peshastin Creek (discussed in detail in Section 4.1.2 of this report). No other monitoring projects are using Microtox® testing at this time.

7.2 RESEARCH AND BMP EFFECTIVENESS MONITORING

The commitments to research and BMP effectiveness and performance monitoring, described in WSDOT's SWMP, include: investigating enhancements to improve the pollutant constituent removal performance of biofiltration swales, conducting performance monitoring on vegetative filter strips, and monitoring constituent removal performance of all experimental BMPs.

7.2.1 Vegetated Stormwater Facility Maintenance

In 2000, WSDOT and the Washington State Transportation Center (University of Washington) conducted a one-year study to provide maintenance recommendations for vegetated roadside ditches and biofiltration swales along freeways and state highways. A final report was completed in December 2000 [WSDOT 2000(a)]. The following is a summary of the report findings.

The purpose of the study was to: (1) assess routine highway ditch cleaning alternatives for water quality benefits; (2) survey biofiltration swales to evaluate conditions promoting water quality benefits; and (3) assess restabilization and revegetation options after ditch cleaning. For the purposes of this study, ditches were defined as drainage courses built with water conveyance as the primary or sole objective. Biofiltration swales were defined as conveyance channels built with the intent of improving the water quality of highway runoff by filtering the runoff through vegetation and other mechanisms that capture and hold water pollutants.

To assess routine highway ditch cleaning alternatives, three different service levels were tested: (1) excavating to the original elevation, re-shaping the upstream three-quarters of the length and then sodding; (2) excavating to the original elevation, re-shaping along the entire length and then applying 3 inches of straw; and (3) excavating to the original elevation, re-shaping the upstream three-quarters of the length, applying 3 inches of straw to the excavated portion, and retaining vegetation in the remainder. Flow volumes and water quality parameters were monitored on stormwater entering and exiting each ditch. Study results indicated that the third alternative, excavating the first three quarters of the ditch and retaining vegetation in the remainder, provided the best overall cost and water quality benefit. Water quality results for a ditch maintained this way showed pollutant reduction levels of 20 to 50 percent.

To assess the condition of biofiltration swales, representative biofiltration swales along central Puget Sound area highways were surveyed for various geometric, hydraulic, and vegetative characteristics. This data was then analyzed to facilitate the development of additional maintenance, design, and construction guidelines. Based on a survey of 20 biofiltration swales, evenly split between freeways and arterial highways, the following conclusions were drawn. Biofiltration swales with a broad side slope, wide base, and potential treatment volumes equivalent to 3 or more inches of runoff, supported good vegetation cover and showed few signs of damage. Biofiltration swales with poor vegetation cover were determined to be the result of poor soil preparation and detrimental maintenance activities. Biofiltration swales with

longitudinal slopes of less than 2.8 percent, gradual side slopes and/or wide beds with no point inlets, and uniform distribution of stormwater to the swale over a vegetated filter strip ranked highest in terms of sufficiency of cross-sectional area for flow conditions, side slope, plant growth substrate, plant suitability, vegetation maintenance, and effects of litter.

A last objective of the project was to assess methods for restabilizing and revegetating areas after ditch cleaning or bioswale renovation activities. Four restabilization and revegetation options were assessed, including: (1) coconut fiber blanket, (2) straw with stapled jute mat, (3) straw without covering, and (4) polyacrylamide. Study results indicated that straw with stapled jute mat had a clear advantage in effectiveness over the alternatives, is comparable in cost, and is an effective means of revegetating impacted facilities.

7.2.2 Infiltration BMP Research Project

In 1998, WSDOT and the United States Geological Survey (USGS) developed a joint agreement to evaluate and monitor the performance of soil additives to reduce infiltration rates of infiltration basins constructed in 1997 at the South Dupont interchange on SR 5. This effort was first summarized in the 5th Year NPDES Annual Report [WSDOT 2000(b)]. The final phases of the pilot tests have been conducted and a final report on development of the stormwater permeable reactive infiltration barrier (SPRIB) media and performance data will be published in late 2001. Upon publication of the associated project documentation this effort will be complete.

7.2.3 Contaminant Detention in Highway Grass Filter Strips

Vegetated filter strips were identified by WSDOT as an appropriate BMP for rural highways with an ADT of less than 30,000 vehicles. A study to evaluate the performance of vegetated highway shoulder filter strips for their treatment effectiveness was conducted on SR 8. The final report for this project was completed in January 2000 (Yonge 2000). Three full-scale test plots were evaluated for contaminant retention capabilities for suspended solids, metals, and total petroleum hydrocarbons. Each of the three test plots was filled with a different media; including non-soil compost, on-site native soil, and topsoil.

The average solids retention for all three test plots was 72 percent, with no significant differences between plots. Total petroleum hydrocarbon (TPH) retention was excellent. Over the duration of the study there were only four occurrences when TPH values were greater than 1 milligram/liter. Anomalous results were found for metal concentrations. Although quite low, metal concentrations exiting the test

plots often exceeded those entering the plots. This was believed to be a result of the slot drain collection system inadvertently trapping sediments, and as a result the test plot influent being defined incorrectly. It was concluded that the filter strips designed in accordance with the WSDOT Highway Runoff Manual are cost effective; and reduce metal, suspended solids, and TPH concentrations reasonably.

7.2.4 Ultra-Urban Stormwater Technology Test Facility

The construction and earthquake retrofit for the Lake Union Ultra-Urban BMP test facility was completed during the spring of 2001. A summary of the facility design was provided in the 5th Year NPDES Annual Report [WSDOT 2000(b)]. The test facility for the WSDOT/EvTEC stormwater technology verification program is located underneath the SR 5 Lake Union Ship Canal Bridge in downtown Seattle, on the north shore of the ship canal. The facility is designed to collect highway runoff from the north half of the Lake Union Ship Canal Bridge, split the flow into four parts, and route the four flows via pipes to four test bays located under the bridge. Each test bay will contain one of the stormwater technologies to be tested. Installation of the stormwater technologies that are slated for testing is near completion. Testing will begin at the site as soon as the installation is completed and is expected to last for a period of one year.

The initial four vendors participating in the project have been selected. A StormVault™ unit manufactured by Jensen Precast (www.jensenprecast.com) will be installed in Test Bay 1. It is basically a wet vault, designed to capture 80 percent of the storm volume, with a patented baffle system to prevent resuspension of removed pollutants. It is the only system of the four to be evaluated that utilizes a batch treatment versus flow-through technology. A treatment train consisting of a BaySaver™ and BayFilter (www.baysaver.com) will be installed in Test Bay 2. The BaySaver™ is a multi-chambered gravity separation system. The BayFilter is a concentric filter system utilizing sand and other filtration media. An AquaShield™ unit (www.aquashieldinc.com) is to be installed in Test Bay 3. The AquaShield™ consists of a Swirl Concentrator followed by the AquaFilter. The AquaFilter is a filtration chamber. The media to be tested has yet to be selected. A StormFilter™ unit manufactured by Stormwater Management, Inc. (www.stormwatermgt.com) is to be installed in Test Bay 4. The StormFilter is a vault containing filtration cartridges. The media for the filtration cartridges has yet to be determined.

Several reports and plans have been completed for this project (Brueske 2000; EvTec and David Evans and Assoc. Inc. 2000; University of Washington 2000). Performance reports for all four stormwater technologies are expected to be completed in 2003, and verification reports are expected to be completed

in 2004. As this is intended to be a long-term research facility, new stormwater technologies will be installed at the site upon completion of this testing session.

The project is unique among most stormwater treatment technology evaluations in that it will evaluate pollutant removal efficiency of the technologies as a function of flow rate (for flow-through technologies only) and pollutant concentration entering the units. The sampling plan for each test bay will be adapted to the unique features of each technology.

7.2.5 Road Shoulder Treatments

In 1995/1996, WSDOT and the Washington State Transportation Center (University of Washington) conducted a one-year monitoring study to evaluate the role that road shoulders play in the stormwater runoff process. The final report for this study was completed in July 1997 (Matthias et al. 1997). However, the major findings of this study are summarized below, as they have not been summarized in past reports.

The purpose of the study was to evaluate the performance of conventional asphalt, gravel, and porous asphalt materials for use in constructing road shoulders. The three shoulder materials were evaluated for hydraulic, hydrologic, runoff water quality, and operational characteristics. The monitoring site was located north of Redmond on a heavily traveled two-lane road.

Eleven storms were monitored between November 1995 and August 1996 at the experimental monitoring site. During typical wet season storms, porous asphalt and gravel shoulders reduced runoff volumes by 85 and 35 percent, respectively, in comparison to asphalt shoulders. Solids and pollutant loads from the porous asphalt shoulders were more than 90 percent lower than the loads from conventional asphalt. Gravel shoulders yielded load reductions of 10 to 70 percent lower than conventional asphalt, with the exception of ortho-phosphorous loads which exceeded those of conventional asphalt by 30 percent. The results of this study indicate that the use of porous asphalt shoulders should provide both the environmental and road operations benefits desired by regulatory and transportation agencies.

In a cost comparison between the three shoulder materials, it was determined that although the cost of installing porous asphalt shoulders may be higher than installation of gravel and asphalt shoulders, porous shoulders could provide long-term cost savings. The long-term cost savings would result from lower runoff volumes and a subsequent decrease in the number of road runoff detention facilities required.

Authors of the report offered the following recommendations.

- Further analysis should be done on porous asphalt shoulders to determine if clogging occurs within five years and if water quality benefits diminish.
- If clogging does not occur within five years a program to install porous asphalt shoulders should be implemented.
- Extractions should be conducted on the gravel mix used in road shoulders to determine the source of phosphorus. It is possible that if the source of the phosphorous containing materials were identified in the gravel mix they could be excluded.

7.2.6 Ecology Embankment/Trench Filter

The SR 167 Ecology Embankment Monitoring Project is being conducted to evaluate the effectiveness of Ecology Embankments in removing highway runoff pollutants. The Ecology Embankment consists of a French-style drain constructed in the pervious shoulder area, parallel to the highway, and filter media surrounding a slotted drainpipe. Runoff drains off the sloped highway to the shoulder, is intercepted by the embankment, and is treated while passing through the filter media. In 2000, flow monitoring was conducted to determine the feasibility of water quality monitoring at the sampling stations. Based on information provided by the flow monitoring effort, water quality data will be collected at a single Ecology Embankment for 12 storm events between June 2001 and April 2002. The evaluated water quality parameters will include total suspended solids, turbidity, pH, hardness, total zinc, dissolved zinc, total phosphorus, and orthophosphate. Particle size distribution of the suspended solids in a stormwater sample from each storm will also be estimated. A Quality Assurance Project Plan (QAPP) has been completed for this project [Taylor and Assoc. Inc. 2001(a)].

7.2.7 Vortechnics Monitoring Project

The SR-405 Vortechnics™ Monitoring Project will provide information to WSDOT regarding the effectiveness of the Vortechs™ Stormwater Treatment System (manufactured by Vortechnics™) to serve as a stormwater pre-treatment BMP. A QAPP has been completed for this project [Taylor and Assoc. Inc. 2001(b)].

The Vortechs™ unit is a three-chambered, swirl-concentrator designed for grit and oil removal as well as flow control. Flow monitoring data was collected during 2000. Both flow and water quality data will be collected for twelve storm events during 2001 and 2002. The project has two objectives: (1) to evaluate

the pollutant removal efficiency of this system, and (2) to evaluate maintenance requirements. The water quality parameters that will be examined for each sample are total suspended solids, turbidity, pH, hardness, total zinc, dissolved zinc, total phosphorus, and orthophosphate. Particle size distribution of the suspended solids in a stormwater sample from each storm will also be measured.

7.2.8 Vegetated/Compost Amended Filter Strip

A short summary of this project was provided in the 5th Year NPDES Annual Report [WSDOT 2000(b)]. Pre-construction (baseline) monitoring is occurring and will be completed in the fall of 2001. Project monitoring will start in the fall of 2001 and is expected to last one year. The approximate completion date for this project is the end of 2002.

7.2.9 Dry Well Retrofit System

A research project entitled *Field Evaluations Of A Cost Effective Method To Retrofit Stormwater Dry Wells Using Permeable Reactive Barriers*, being conducted by Washington State University (WSU), is in the initial stages (Yonge and Hossain 2000).

The objective of this research project is to monitor the contaminants in stormwater after treatment with a stormwater permeable reactive infiltration barrier (SPRIB) treatment media developed by USGS. The SPRIB treatment media will be inserted into an existing dry well. The results of this project will define the efficiency of the SPRIB for removing contaminants from stormwater.

An automated sample collection system is being developed in a laboratory at WSU, and a comprehensive literature review is being conducted at this time. The project site will be in Spokane County, although a specific location has yet to be determined. Monitoring for this project is expected to last one year with project completion anticipated for early 2003.

SECTION 8.0
CERTIFICATIONS

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM
MUNICIPAL STORMWATER PERMIT PROGRAM

I certify under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for willful violations.

Jerry W. Abb
Director, Environmental Services
Washington State Department of Transportation

10/24/01
Date

SECTION 9.0
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APPENDIX A

WSDOT 2001 BMP CONSTRUCTION ACTIVITIES SUMMARY

TABLE A-1. NEW BMP FACILITIES CONSTRUCTED BETWEEN JULY 2000 AND JULY 2001
(Page 1 of 2)

State Route	Project Name	Milepost or Station	Offset Direction	WQMA	BMP Type	Facility Size
SR 7	SR 7 MP 40 to MP 42.5	SR 7 64+650	Left	South Puget Sound	Detention Pond/ BMP RD.11 w/Bioswale	1.83 ac-ft
SR 7	SR 7 MP 40 to MP 42.5	SR 7 66+280	Left	South Puget Sound	Detention Pond/ BMP RD.11 w/Bioswale	3,702 cf
SR 7	SR 7 MP 40 to MP 42.5	K line 1+220	Right	South Puget Sound	Settling Pond/ BMP RD.05	0.23 ac-ft
SR 7	SR 7 MP 40 to MP 42.5	K line 1+270	Right	South Puget Sound	Infiltration Pond/ BMP R1.06	3,850 cf
SR 7	SR 7 MP 40 to MP 42.5	J line 0+030	Right	South Puget Sound	Settling Pond/ BMP RD.05	0.13 ac-ft
SR 7	SR 7 MP 40 to MP 42.5	J line 0+040	Right	South Puget Sound	Infiltration Pond/ BMP R0.16	3,536 cf
SR 7	SR 7 MP 40 to MP 42.5	SR7 64+420 to 64+600	Left	South Puget Sound	Bioswale/ BMP RB.05	
SR 7	SR 7 MP 40 to MP 42.5	SR7 64+500 to 64+600	Right	South Puget Sound	Bioswale/ BMP RB.05	
SR 7	SR 7 MP 40 to MP 42.5	SR 7 67+400 to 67+580	Left	South Puget Sound	Bioswale/ BMP RB.05	
SR 7	SR 7 MP 40 to MP 42.5	SR 7 67+520 to 67+580	Right	South Puget Sound	Bioswale/ BMP RB.05	
SR 7	SR 7 MP 40 to MP 42.5	SR 7 67+660 to 67+740	Left	South Puget Sound	Bioswale/ BMP RB.05	
SR 7	SR 7 MP 40 to MP 42.5	SR 7 67+660 to 67+800	Right	South Puget Sound	Bioswale/ BMP RB.05	
SR 7	SR 7 MP 40 to MP 42.5	SR 7 68+100 to 68+200	Left	South Puget Sound	Bioswale/ BMP RB.05	
SR 7	SR 7 MP 40 to MP 42.5	SR 7 68+100 to 68+450	Right	South Puget Sound	Bioswale/ BMP RB.05	
SR 512	94th Ave I/C South Hill Park-and-Ride Lot	L line 2+880	Right	South Puget Sound	Wet Vault/ BMP RD.15	1,450 cf
SR 512	94th Ave I/C South Hill Park-and-Ride Lot	L line 2+900	Right	South Puget Sound	Wet/Detention Pond BMP RD.05	12,920 sf
SR 507	Bald Hills Rd. To MP 36.5	SR 507 10+680 to 10+720	Left	South Puget Sound	Bioswale/ BMP RB.05	108 sf
SR 507	Bald Hills Rd. To MP 36.5	SR 507 10+815 to 10+855	Right	South Puget Sound	Bioswale/ BMP RB.05	388 sf
SR 5	Ridgefield Weigh Station Stormwater System	MP 15.2	Right	Clark County	Biofiltration Swale BMP RB.05 (HRM) Dry pond BMP RD.11 (HRM)	4.30 acres
SR 14	SE 192nd Ave. Interchange	L 14+540 to L 14+680	Left	Clark County	Biofiltration Swale BMP RB.05 (HRM) Dry pond BMP RD.11 (HRM)	0.14 acres
SR 14	SE 192nd Ave. Interchange	L 14+712 to L 15+252	Left	Clark County	Biofiltration Swale BMP RB.05 (HRM) Dry pond BMP RD.11 (HRM)	0.73 acres
SR 14	SE 192nd Ave. Interchange	L 15+252 to 16+640 including Brady Rd.	Right	Clark County	Biofiltration Swale BMP RB.05 (HRM) Dry pond BMP RD.11 (HRM)	5.75 acres
SR 14	SE 192nd Ave. Interchange	L 16+640 to 17+002	Right	Clark County	Biofiltration Swale BMP RB.05 (HRM) Dry pond BMP RD.11 (HRM)	0.48 acres
SR 14	SE 192nd Ave. Interchange (164th Ave. addendum)	A 1+053 to A 1+212	Left	Clark County	Biofiltration Swale BMP RB.05 (HRM) Dry pond BMP RD.11 (HRM)	0.15 acres
Sunset / SR 542	Sunset/SR 542 Vicinity to Nooksack River Bridge 5/828E – C5686	255.36 – 263.05		Nooksack Basin	2 Dry Ponds with Biofilters. 2 Bio-swales and 4 Vegetation Ditches	

APPENDIX A-1. NEW BMP FACILITIES CONSTRUCTED BETWEEN JULY 2000 AND JULY 2001
(Page 2 of 2)

State Route	Project Name	Milepost or Station	Offset Direction	WQMA	BMP Type	Facility Size
SR 520	104th Ave. NE to West Lake Sammamish Parkway -- C4849	6.02-7.05 7.05-8.07 8.07-9.90 9.90-11.80		Yarrow Creek Basin Kelsey Creek Basin Valley Creek Basin Sammamish River Basin	15 Biofiltration Swales, 24 Quarry Spall Outfall Protection, 51 Rock Check Dams 1 Detention Pond 2 Detention Vaults	
SR 520	NE 40th Street Vicinity – C5620	9.26-11.02		Sammamish River Basin	6 Biofiltration Swales, 12 Quarry Spall Outfall Protection, 1 Detention Vault	
SR 2	Sultan-Startup Road Channelization – C5938	25.36-25.70		Snoqualmie / Snohomish River Basin	8 Infiltration Ponds, 9 Infiltration Trenchs	
SR 5	Stanwood / Bryant Vicinity NB Weigh Station	213.63-215.04		Stillaguamish River Basin	5 Detention Ponds, Vegetative Filter Strips, 7 Quarry Spall Outfall Protection, 3 Biofiltration Swales	

APPENDIX B

WSDOT STORMWATER MONITORING AND RESEARCH ACTIVITIES SUMMARY

TABLE B-1. STATUS OF WSDOT MONITORING PROJECTS SUMMARIZED IN THE 2001 NPDES ANNUAL REPORT
(Page 1 of 2)

Project Name (Report Section)	Status	Project Description	Stormwater Management Plan Table 21 Cross Reference
Microtox Testing (Sections 4.1.2 and 7.1.4)	Long-term testing used in several projects • Project completed on Peshastin Creek (Yonge and Marcoe 2001).	Evaluation of stormwater and receiving water toxicity.	Not Referenced
Long Term Characterization (Section 7.1.1)	In Progress • This program element has not been clearly defined. It is likely to represent a three to five year effort. • Low, medium, high, and ultra-high volume sites have been preliminarily identified. • A Sampling Plan has been prepared for the High Volume Site Characterization [WSDOT 2001(a)]. • Monitoring has begun at the ultra-high site. • Some characterization information is also available for a low volume site on SR 8.	To meet current permit commitments a stormwater characterization monitoring program is needed. This would entail characterization of sites with different traffic volumes.	Not specifically referenced. However, the following were related to this work: SR 5 / 169-M-0 SR 5 / 2.80-R-65 SR 5 / 18.19-L-65
Pesticide/Priority Pollutant Scans (Section 7.1.2)	In Progress • A monitoring plan [WSDOT 2001(b)] and preliminary results [WSDOT 2001(c)] have been completed.	Determine pesticide concentrations in accumulated sediments from long-term characterization sites and others.	Not Referenced
BaySaver SR 101 (Section 7.1.3)	In Progress • A monitoring plan [WSDOT 2001(d)] has been completed. • Monitoring to occur through January 2003. • Report will be available in 2003.	Characterize accumulated sediments to determine maintenance needs and disposal options.	Not Referenced
Vegetated Stormwater Facility Maintenance (Section 7.2.1)	Completed [WSDOT 2000(a)]	Assess routine highway ditch cleaning alternatives to evaluate conditions benefiting water quality and assess restabilization and revegetation options.	Not Referenced
Infiltration BMP Research Dupont (Section 7.2.2)	In Progress • Summarized in the 1999 and 2000 NPDES reports. • Report due late 2001.	Originally used gypsum soil additives to limit infiltration rates in infiltration basins. However, the project shifted to developing a filtration media that could be used to top-dress infiltration basins.	SR 5 / 118.9
Contaminant Detention in Highway Grass Filter Strips - SR 8 (Section 7.2.3)	Completed (Yonge 2000), also summarized in the 1999 NPDES Annual Report.	Investigation of potential for vegetated highway shoulders with different surface soils to remove pollutants.	SR 8 / 15.8-L-22

TABLE B-1. STATUS OF WSDOT MONITORING PROJECTS SUMMARIZED IN THE 2001 NPDES ANNUAL REPORT
(Page 2 of 2)

Project Name (Report Section)	Status	Project Description	Stormwater Management Plan Table 21 Cross Reference
Ultra-Urban Stormwater Treatment Testing (Ship Canal) (Section 7.2.4) This location may also serve as characterization site for ultra-high volume >200,000 ADT	• Summarized/updated in the 1998,1999, and 2000 NPDES Annual Reports. • Facility construction completed in the spring of 2001. • Sampling to start in the fall of 2001 and last one year. • Management plan completed (UW 2000). • Evaluation plan completed (EvTEC and David Evans 2000). • Baseline characterization completed (Brueske 2000). • Sampling plans/QAPPs will be developed during 2001. • Performance reports for all technologies expected in 2003. • Verification reports for all technologies expected in 2004. • Long-term research facility.	Testing of pollutant removal efficiency of four different stormwater treatment components appropriate for confined spaces: Stormvault (Wet vault w/ patented baffle system), Bay Savers/Bay Filter (Multi-chambered gravity separation w/ concentric filter of sand & other media), Aqua Shield/Aqua Filter (Swirl Concentrator w/ filtration chamber), Stormfilter (Vault w/ filtration cartridges).	SR 5 / 169-M-0
Road Shoulder Treatments (Section 7.2.5)	Completed in 1997 (Matthias and Horner 1997), not previously addressed in annual NPDES reports.	Test different shoulder treatments (conventional asphalt, gravel, or porous asphalt) to determine which yields the least quantity of runoff with the highest quality.	Not Referenced
Ecology Embankment/ Trench Filter SR 167@ Kent and Auburn (Section 7.2.6)	In Progress • Stormwater sampling to start the summer of 2001 and is expected to last one year [Taylor and Assoc. 2001(a)].	Evaluate effectiveness of media filtration in roadway embankments for pollutant removal.	SR 167 / 25.35
Vortechs Swirl Concentration System SR 405 (Section 7.2.7)	In Progress • Mentioned in the 1998 NPDES Annual Report. • Storm sampling began March 2001 and is expected to last one year [Taylor and Assoc. 2001(b)].	Evaluation of the pollutant removal effectiveness of a Vortechnics unit.	SR 405 / 24.54-L-8
Vegetated/ Compost Amended Filter Strip - Sleater-Kinney to Marvin (Section 7.2.8)	In Progress • 1st phase and 2nd phase discussed in 1999 and 2000 NPDES Reports. • Pre-construction monitoring occurring in 2001. • Monitoring to include one wet and one dry season. • Expected completion date September 2002.	Testing treatment effectiveness of vegetated/compost amended filter strips on roadside runoff rates and water quality.	Not Referenced
Dry Well Retrofit System – Spokane (Section 7.2.9)	In Progress (lab testing) • Methodology developed (Yonge and Hossain 2000). • Testing occurring in 2001 and 2002. • One year of monitoring. • Report expected in early 2003.	Investigate a drywell retrofit strategy using SPRIB treatment media developed by the USGS.	Not Referenced

TABLE B-2. STATUS OF WSDOT MONITORING PROJECTS NOT SUMMARIZED IN THE 2001 NPDES ANNUAL REPORT			
Project Name	**Status**	**Project Description**	**Stormwater Management Plan Table 21 Cross Reference**
Bike Path Runoff Characterization I 5	Completed • Some monitoring completed in 2000. • No report expected at this time.	Characterization of bike path runoff. This project was requested by the regional project office and is not related to any specific NPDES requirement.	Not Referenced
Stormceptor Vaults SR 522	No Progress • Monitoring canceled due to hazardous location.	Pollutant removal effectiveness testing on installed facilities.	SR 522 / 6.63-R-15
PAM for Soil Erosion Control (SR 18)	Completed • Summarized in the 1999 NPDES Report. • Included in new Stormwater Manual.	Tested the performance of PAM to abate soil erosion and improve soil texture. Evaluated the optimum dosing method and application rates for prevention of erosion to exposed soils as evaluated through runoff turbidity data.	SR 18 / 6.72-R-42
PAM Flocculant Dissolution	Completed • Reported in the 1999 and 2000 NPDES Annual Reports.	Rate testing conducted for an Experimental Passive Dosing System to reduce stormwater turbidity.	SR 18 / 6.72-R-42
Ecology Ditch SR 5 Mountlake Terrace	Possible future need. • Some monitoring in 1993 and project completed in 1994. • No new installations to test.	Evaluate the effectiveness of the use of this treatment mechanism (a bioswale underlain with perforated pipe and sand).	Not Referenced
SR 5 / North Clark County Stormwater Characterization – Low Impervious Surface	Cancelled/New site identified. (This site was not appropriate for monitoring due to excessive groundwater infiltration)	Characterize stormwater runoff from a site with a medium ADT volume.	SR 5 / 18.19 L-65
SR 5 Vancouver	Cancelled/New site identified at SR 5 in Olympia.	Characterize stormwater runoff from a site with a high ADT volume.	SR 5 / 2.80-R-65
S. Snohomish Co.Multi-cell Wetpond Evaluation	Cancelled/No funding for monitoring.	Evaluate treatment effectiveness of a mult-cell wetpond with a constructed wetland.	SR 5 / 184.3-R-24